

Exercise 23, p. 163 (Section 3.3)

> **Eqn1:=3*diff(u(t),t\$2)-diff(u(t),t)+2*u(t)=0;**

$$Eqn1 := 3 \left(\frac{d^2}{dt^2} u(t) \right) - \left(\frac{d}{dt} u(t) \right) + 2 u(t) = 0 \quad (1)$$

> **Y1:=dsolve({Eqn1,u(0)=2,D(u)(0)=0},u(t));**

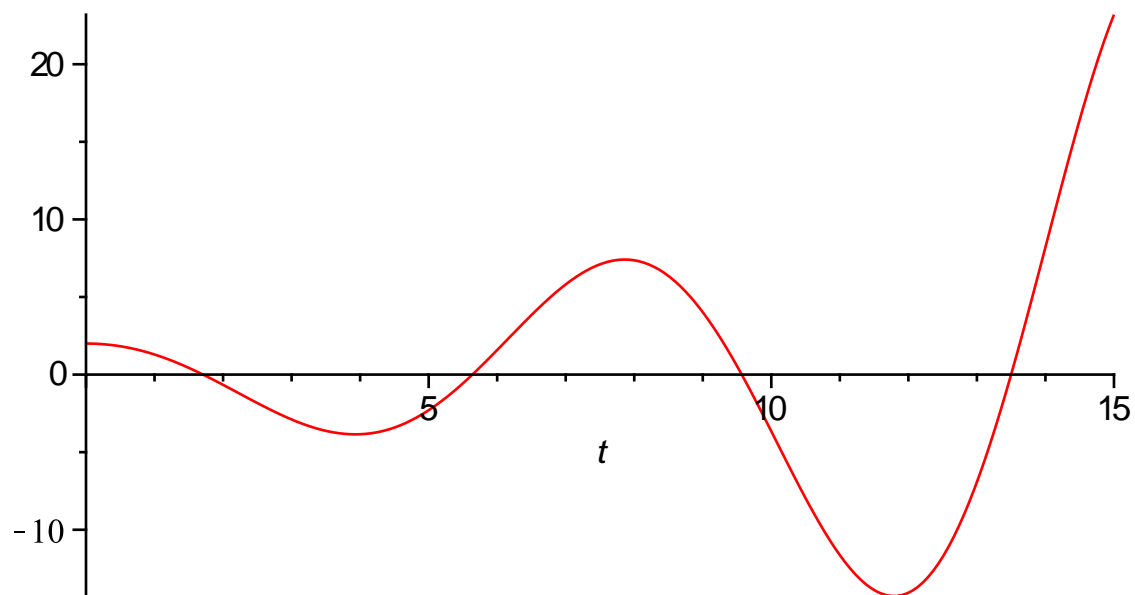
$$Y1 := u(t) = -\frac{2}{23} \sqrt{23} e^{\frac{1}{6} t} \sin\left(\frac{1}{6} \sqrt{23} t\right) + 2 e^{\frac{1}{6} t} \cos\left(\frac{1}{6} \sqrt{23} t\right) \quad (2)$$

> **Y2:=rhs(Y1);**

$$Y2 := -\frac{2}{23} \sqrt{23} e^{\frac{1}{6} t} \sin\left(\frac{1}{6} \sqrt{23} t\right) + 2 e^{\frac{1}{6} t} \cos\left(\frac{1}{6} \sqrt{23} t\right) \quad (3)$$

Plot this- we want to find where |Y2|=10.

> **plot(Y2,t=0..15);**



From the graph, t is between 10 and 11. Use "fsolve" for a numerical solver - use plain "solve" if you think there is a "nice" solution.

> **S1:=fsolve(Y2=-10,t=10..11);**

$$S1 := 10.75977055$$

(4)